Claims

What is claimed is:

1. A system for automatically aligning one end of a passenger loading bridge to an aircraft having a doorway, comprising:

a transmitter disposed aboard the aircraft for providing an electromagnetic signal for use in aligning the one end of the passenger loading bridge to the doorway of the aircraft;

a receiver disposed aboard the passenger loading bridge for receiving the electromagnetic signal transmitted from the transmitter and for providing an electrical output signal relating to the electromagnetic signal;

a bridge controller in operative communication with the receiver, for receiving the electrical output signal provided from the receiver, for determining a next movement of the one end of the passenger loading bridge in a direction toward the doorway of the aircraft based upon the electrical output signal, and for providing a control signal relating to the determined next movement; and

a drive mechanism in communication with the bridge controller, for receiving the control signal provided from the bridge controller, and for driving the one end of the passenger loading bridge in the determined direction toward the doorway of the aircraft.

2. A system according to claim 1, wherein the transmitter comprises an optical transmitter including a light source for providing the electromagnetic signal within a predetermined region of the electromagnetic spectrum within one of the infrared region, the visible region, and the ultraviolet region of the electromagnetic spectrum and wherein the receiver comprises an optical receiver including a detector element for detecting the electromagnetic signal within the predetermined region of the electromagnetic spectrum and for producing the electrical output signal.

3. A system according to claim 2, wherein the receiver comprises an optical receiver including a lens and a charge coupled device detector having a plurality of rows and a plurality of columns of individual detector elements.

4. A system according to claim 2, wherein the receiver comprises an optical receiver including an aperatured mask for imaging the electromagnetic signal onto a position sensitive photodetector disposed on a side of the aperatured mask that is opposite the light source.

5. A system according to claim 4, wherein the aperatured mask includes at least two apertures and wherein the optical receiver captures sufficient information to determine distance and angle of displacement of the transmitter.

6. A system according to claim 1, wherein the transmitter comprises a radio-frequency transmitter and the receiver comprises a radio-frequency receiver.

7. A system according to claim 6, wherein the radio-frequency receiver includes a directional antenna for use in determining a direction from a location of the radio-frequency receiver to a location of the radio-frequency transmitter.

8. A system according to claim 7, wherein the directional antenna includes two antennas for use in triangulation to determine the location of the radio-frequency transmitter.

9. A system according to claim 1, including a processor in electrical communication with the transmitter, for receiving ancillary information relating to the aircraft and for providing to the transmitter an electrical signal encoded with data corresponding to the ancillary information and relating to the electromagnetic signal.

10. A system according to claim 9, comprising a data entry device in operative communication with the processor for supporting entry of the ancillary information by a user aboard the aircraft.

11. A system according to claim 10, comprising a memory circuit in electrical communication with the processor for retrievably storing the ancillary information for access by the processor.

12. A system according to claim 9, comprising:

a second transmitter disposed aboard the passenger loading bridge and in operative communication with the bridge controller, for providing a second electromagnetic signal corresponding to other data for use in aligning the one end of the passenger loading bridge to the doorway of the aircraft; and

a second receiver disposed aboard the aircraft and in operative communication with the processor, for receiving the second electromagnetic signal and for providing to the processor a second electrical output signal relating to the other data.

13. A system according to claim 12, including an information display device in communication with the processor for receiving the second electrical output signal therefrom and for displaying one of an alignment complete indication and an alignment incomplete indication in dependence upon the received second electrical output signal.

14. A system according to claim 12, including a transceiver fixedly mounted at a predetermined position remote from each one of the aircraft and the one end of the passenger loading bridge, the transceiver for receiving electromagnetic signals transmitted from at least one of the transmitter and the second transmitter, and for transmitting electromagnetic signals to at least one of the receiver and the second receiver.

15. A system according to claim 14, including a second processor in electrical communication with the transceiver, for determining a next taxiing action of the aircraft based on the received electromagnetic signals, and for providing a third electrical control signal relating to the determined next taxiing action of the aircraft.

16. A system according to claim 15, including a second display device in electrical communication with the second processor, for receiving the third electrical control signal transmitted from the second processor, and for displaying a human intelligible instruction relating to the determined next taxiing action of the aircraft.

17. A system according to claim 15, including a control circuit disposed aboard the aircraft and in communication with the second receiver and with a central computer system of the aircraft, the control circuit for receiving the third electrical control signal transmitted from the transceiver to the second receiver, and for providing the third electrical control signal to the central computer system of the aircraft for performing the determined next taxiing action of the aircraft.

18. A system according to claim 14, including a second transceiver fixedly mounted at a predetermined location that is remote from each one of the transmitter, the second transmitter and the transceiver, the second transceiver for co-operating with the transceiver and at least one of the transmitter and the second transmitter to determine a location of the at least one of the transmitter and the second transmitter.

19. A system for automatically aligning one end of a passenger loading bridge to an aircraft having a doorway, comprising:

a transmitter disposed aboard the aircraft for wirelessly transmitting an electromagnetic signal for use in aligning the one end of the passenger loading bridge to the doorway of the aircraft;

a transceiver for receiving the electromagnetic signal transmitted from the transmitter and for providing a second electromagnetic signal relating to the received electromagnetic signal;

a processor in electrical communication with the transceiver, for determining a next movement of at least one of the aircraft and the one end of the passenger loading bridge for relatively moving the one end of the passenger loading bridge in a direction toward the doorway of the aircraft, for producing an electrical output signal indicative of the determined next movement and relating to the second electromagnetic signal, and for providing the electrical output signal to the transceiver; and

a receiver disposed aboard the passenger loading bridge for receiving at least one of the electromagnetic signal and the second electromagnetic signal and for producing a second electrical output signal relating to the at least one of the electromagnetic signal and the second electromagnetic signal.

20. A system according to claim 19, including:

a second receiver disposed aboard the aircraft for receiving the second electromagnetic signal transmitted from the transceiver and for providing a third electrical output signal relating to the second electromagnetic signal; and

a control unit in electrical communication with the second receiver and with a central computer system of the aircraft, for receiving the third electrical output signal from the second receiver and for controlling the determined next movement of the aircraft based on the third electrical output signal.

21. A system according to claim 20, comprising:

a bridge controller in operative communication with the receiver, for receiving the second electrical output signal from the wireless receiver, and for providing an electrical control signal relating to the second electrical output signal; and

a drive mechanism in electrical communication with the bridge controller, for receiving the electrical control signal and for driving the passenger loading bridge in the determined direction toward the doorway of the aircraft based on the electrical control signal.

22. A system according to claim 19, comprising:

a bridge controller in operative communication with the receiver, for receiving the second electrical output signal from the receiver, and for providing an electric control signal relating to the second electrical output signal; and

a drive mechanism in electrical communication with the bridge controller, for receiving the electrical control signal and for driving the passenger loading bridge in the determined direction toward the doorway of the aircraft based on the electrical control signal.

23. A system according to claim 22, comprising:

a display device in electrical communication with the processor, for receiving the electrical output signal from the processor, and for displaying a human intelligible instruction relating to the determined next movement of the aircraft.

24. A system according to claim 22, including:

a second transmitter disposed aboard the passenger loading bridge and in operative communication with the bridge controller, the second transmitter for wirelessly transmitting a third electromagnetic signal;

a second transceiver fixedly mounted at a predetermined location that is remote from each one of the transmitter, the second transmitter and the transceiver, the second transceiver for co-operating with the transceiver and at least one of the transmitter and the second transmitter to determine a location of the at least one of the transmitter and the second transmitter.

25. A method of automatically aligning one end of a passenger loading bridge to an aircraft having a doorway, comprising the steps of:

a) transmitting a first electromagnetic signal forming a beacon using a transmitter disposed proximate a doorway of the aircraft, to which doorway the one end of the passenger loading bridge is to be aligned;

b) receiving the beacon using a receiver disposed at a location remote from the transmitter;

c) determining a displacement indicated by the beacon;

d) providing a control signal based on the determined displacement; and

e) automatically moving the one end of the passenger loading bridge in a direction toward the doorway of the aircraft based on the control signal.

26. A method according to claim 25, wherein the receiver is disposed aboard the passenger loading bridge near the one end and wherein the step of c) determining a displacement includes the step of determining a direction along which the strength of the beacon is a maximum value.

27. A method according to claim 25, wherein the receiver is disposed aboard the passenger loading bridge near the one end and wherein the step of c) determining a displacement includes the step of determining a distance indicated by the beacon.

28. A method according to claim 25, wherein the receiver is disposed at a location that is remote from each one of the transmitter and the one end of the passenger loading bridge and wherein the step of c) determining the displacement includes the steps of:

c1) transmitting a second electromagnetic signal using a second transmitter disposed aboard the passenger loading bridge near the one end;

c2) receiving the second electromagnetic signal using the receiver; and

c3) performing a triangulation function based on the beacon and the second electromagnetic signal to determine the direction to a source of the beacon.

29. A method according to claim 28, wherein the receiver is disposed aboard the passenger loading bridge near the one end and wherein the step of c) determining a displacement includes the step of determining a distance indicated by the beacon.

30. A method according to claim 25, wherein the step of c) determining a displacement includes the steps of:

c1) providing a second receiver at a location remote from each one of the transmitter and the receiver;

c2) performing a first triangulation function using the transmitter, the receiver and the second receiver to determine the displacement.

31. A method according to claim 30, including the steps of:

providing a second transmitter near the one end of the passenger loading bridge;

performing a second triangulation function using the second transmitter, the receiver and the second receiver, to determine a location of the second transmitter; and

providing a second control signal based on the determined location of the second transmitter.

32. A method according to claim 31, wherein the step of e) automatically moving the one end of the passenger loading bridge in a direction toward the doorway of the aircraft based upon the control signal includes the steps of:

e1) determining a next movement of the one end of the passenger loading bridge for moving the one end of the passenger loading bridge in a the determined direction;

e2) performing the determined next movement of the one end of the passenger loading bridge; and

e3) repeating steps a) to e2) until the first and second control signals are approximately a same value.

33. A method according to claim 25, wherein the beacon includes information relating to the aircraft, the method including the steps of:

determining an estimated stopping position of the doorway of the aircraft while the aircraft is in motion and based upon the beacon; and

moving the one end of the passenger loading bridge to a preposition close to the estimated stopping position.

34. A method according to claim 33, wherein the step of determining an estimated stopping position of the doorway of the aircraft includes the steps of:

extracting data indicative of a type of the aircraft from the beacon; and

retrieving data from a memory relating to the estimated stopping position of the doorway for the indicated type of aircraft.

35. A method according to claim 25, wherein the beacon is a generic beacon.

36. A method according to claim 25, wherein the first electromagnetic signal forming the beacon is an optical signal.

37. A method according to claim 36, wherein the optical signal is transmitted using a wavelength from an infrared region of the electromagnetic spectrum.

38. A method according to claim 36, wherein the optical signal is transmitted using a wavelength from a visible region of the electromagnetic spectrum.

39. A method according to claim 36, wherein the optical signal is transmitted using a wavelength from an ultraviolet region of the electromagnetic spectrum.

40. A method according to claim 36, wherein the optical signal is focused through a lens onto a sensor array having N rows and M columns and wherein at least a column on which the optical signal is focused is indicative of the displacement.

41. A method according to claim 40, wherein a row upon which the optical signal is focused is also indicative of the displacement.

42. A method according to claim 41, wherein the row and column are indicative of an angular displacement between the one end and the doorway

43. A method according to claim 36, wherein the optical signal is focused on an array of optical sensors through at least two apertures.

44. A method according to claim 36, wherein a range sensor is used to determine angular displacement and distance between doorway and the one end.

45. A method according to claim 25, wherein the first electromagnetic signal forming the beacon is a radio-frequency signal.